

What Is Claimed Is:

1. Apparatus for attaching tissue to bone comprising:

an expandable body defining a bore and configured to expand into bone, said expandable body comprising a distal tip member and a proximal main member, said distal tip member being of harder material than said proximal main member, said distal tip member having a threaded recess in a proximal surface thereof and said proximal main member having a distally extending threaded projection threadedly interengageable with the distal tip member recess;

an expander pin comprising a shaft sized to be received in the bore of said expandable body and expand said expandable body laterally when said expander pin is driven into said expandable body; and

tissue attachment means associated with said shaft;

whereby when said expander pin is driven into said expandable body, said expandable body is attached to the bone and said tissue attachment means secures the tissue to said apparatus.

2. Apparatus according to claim 1 wherein said expander pin includes fastener stabilization apparatus for stabilizing said expander pin relative to said expandable body.

3. Apparatus according to claim 2 wherein said fastener stabilization apparatus comprises threads.

4. Apparatus according to claim 2 wherein said fastener stabilization apparatus comprises ribs.

5. Apparatus according to claim 1 wherein said tissue attachment means comprises at least one laterally-extending projection for tacking tissue.

6. Apparatus according to claim 5 wherein said at least one laterally-extending projection has a substantially linear outer edge.

7. Apparatus according to claim 5 wherein said at least one laterally-extending projection has a substantially arc-like outer edge.

8. Apparatus according to claim 1 wherein said tissue attachment means comprises a bore formed in said expander pin and a suture extending through said expander pin bore.

9. Apparatus according to claim 8 wherein said tissue attachment means is configured so that said suture may slide relative to said expander pin when said expander pin is received in said expandable body.

10. Apparatus according to claim 8 wherein said tissue attachment means further comprises a second bore formed in said expander pin and a second suture extending through said second expander pin bore.

11. Apparatus according to claim 1 wherein said expander pin has indicia for indicating depth.

12. Apparatus according to claim 1 wherein said expandable body distal tip is tapered.

13. Apparatus according to claim 1 wherein said expandable body includes bone securement apparatus for securing said expandable body relative to bone.

14. Apparatus according to claim 13 wherein said bone securement apparatus comprises ribs.

15. Apparatus according to claim 13 wherein said bone securement apparatus comprises threads.

16. Apparatus according to claim 1 wherein said apparatus further comprises an installation tool, and wherein said installation tool comprises a shaft sized to be slidingly received in said bore of said expandable body and in a bore of said expander pin.

17. Apparatus according to claim 16 wherein said shaft is releasably attachable to said expandable body.

18. Apparatus according to claim 16 wherein said shaft and said expandable body are threadingly interengageable with one another.

19. Apparatus according to claim 16 wherein said shaft has a tapered distal end.

20. Apparatus according to claim 16 wherein said shaft extends distally beyond said expandable body when said shaft is slidably received in said bore of said expandable body.

21. Apparatus according to claim 16 wherein said apparatus further comprises a pusher member configured to drive said expander pin into said expandable body.

22. Apparatus according to claim 21 wherein said pusher member slides along said shaft when driving said expander pin into said expandable body.

23. Apparatus according to claim 1 wherein said apparatus further comprises a cannulated driver assembly adapted to drive said expander pin into said expandable body.

24. Apparatus according to claim 23 wherein said cannulated driver assembly slides along a shaft connected to said expandable body.

25. Apparatus according to claim 23 wherein said cannulated driver assembly includes a trigger for inducing the driving of said expander pin.

26. Apparatus according to claim 23 wherein said cannulated driver assembly comprises a slap hammer.

27. Apparatus for attaching tissue to bone comprising:

an installation tool comprising a shaft having a distal end and a proximal end, said distal end of said shaft terminating in a relatively hard distal point;

an expandable body configured to expand into bone, said expandable body comprising a distal tip member and a proximal main member, said distal tip member being of harder material than said proximal main member, said distal tip member having a threaded recess in a proximal surface thereof and said proximal main member having a distally extending threaded projection

threadedly interengageable with the distal tip member recess, and an opening extending from a distal end of said expandable body to a proximal end of said expandable body, said opening being sized to receive said shaft of said installation tool, and connecting apparatus for connecting said expandable body to said shaft of said installation tool when said distal end of said shaft of said installation tool protrudes from said distal end of said expandable body;

an expander pin comprising a shaft sized to be received in said opening in said expandable body and expand said expandable body radially when said expander pin is driven distally into said expandable body, and tissue attachment means associated with said shaft of said expander pin, said expander pin defining a bore sized to receive said shaft of said installation tool; and

tissue attachment means associated with at least one of said expandable body and said expander pin;

whereby when said expander pin is driven into said expandable body, said expandable body will be attached to bone and said tissue attachment means will secure tissue to said apparatus.

28. Apparatus for attaching tissue to bone comprising:

a shaft;

an expandable body configured to expand into bone and comprising a distal tip member and a proximal main member, said distal tip member being of harder material than said proximal main member, said distal tip member having a threaded recess in a proximal surface thereof and said proximal main member having a distally extending threaded projection threadedly interengageable with the distal tip member recess, and said expandable body defining an opening, and said expandable body comprising connection apparatus for connecting said shaft to said expandable body;

an expander pin comprising a shaft sized to be received in said opening in said expandable body and expand said expandable body radially when said expander pin is driven into said expandable body; and

tissue attachment apparatus associated with at least one of said expandable body and said expander pin;

whereby when said shaft is connected to said expandable body, and said expander pin is driven into said expandable body, said shaft can provide a counterforce to said expandable body so as to counteract the driving force applied to said expander pin.

29. Apparatus for attaching tissue to bone comprising:

an expandable body configured to expand into bone, said expandable body defining a bore;

an expander pin comprising a shaft sized to be received in the bore of said expandable body and expand said expandable body laterally when said expander pin is driven into said expandable body; and

tissue attachment means associated with said shaft;

whereby when said expander pin is driven into said expandable body, said expandable body is attached to the bone and said tissue attachment means secures the tissue to said apparatus.

30. Apparatus according to claim 29 wherein said expander pin includes fastener stabilization apparatus for stabilizing said expander pin relative to said expandable body.

31. Apparatus according to claim 30 wherein said fastener stabilization apparatus comprises threads.

32. Apparatus according to claim 30 wherein said fastener stabilization apparatus comprises ribs.

33. Apparatus according to claim 29 wherein said tissue attachment means comprises at least one laterally-extending projection for tacking tissue.

34. Apparatus according to claim 33 wherein said at least one laterally-extending projection has a substantially linear outer edge.

35. Apparatus according to claim 33 wherein said at least one laterally-extending projection has a substantially arc-like outer edge.

36. Apparatus according to claim 29 wherein said tissue attachment means comprises a bore formed in said expander pin and a suture extending through said expander pin bore.

37. Apparatus according to claim 36 wherein said tissue attachment means is configured so that said suture is slidable relative to said expander pin when said expander pin is received in said expandable body.

38. Apparatus according to claim 36 wherein said tissue attachment means further comprises a second bore formed in said expander pin and a second suture extending through said second expander pin bore.

39. Apparatus according to claim 29 wherein said expander pin has indicia for indicating depth.

40. Apparatus according to claim 29 wherein said expandable body is provided with a tapered distal end.

41. Apparatus according to claim 29 wherein said expandable body comprises a distal tip member and a

proximal main member, said distal tip member being separable from said proximal main member.

42. Apparatus according to claim 41 wherein said distal tip member and said proximal main member are threadedly interengageable with one another.

43. Apparatus according to claim 41 wherein said distal tip member and said proximal main member are frictionally interengageable with one another.

44. Apparatus according to claim 29 wherein said expandable body comprises a distal tip member constructed from a first material and a proximal main member constructed from a second material, and wherein said first material is harder than said second material.

45. Apparatus according to claim 41 wherein said expandable body distal tip member is tapered.

46. Apparatus according to claim 29 wherein said expandable body includes bone securement apparatus for securing said expandable body relative to bone.

47. Apparatus according to claim 46 wherein said bone securement apparatus comprises ribs.

48. Apparatus according to claim 46 wherein said bone securement apparatus comprises threads.

49. Apparatus according to claim 29 wherein said apparatus further comprises an installation tool, and wherein said installation tool comprises a shaft sized to be slidingly received in said bore of said expandable body and a bore of said expander pin.

50. Apparatus according to claim 49 wherein said shaft is releasably attachable to said expandable body.

51. Apparatus according to claim 49 wherein said shaft and said expandable body are threadedly interengageable with one another.

52. Apparatus according to claim 49 wherein said shaft is provided with a tapered distal end.

53. Apparatus according to claim 49 wherein said shaft extends distally beyond said expandable body when said shaft is slidingly received in said bore of said expandable body.

54. Apparatus according to claim 49 wherein said apparatus further comprises a pusher member configured to drive said expander pin into said expandable body.

55. Apparatus according to claim 54 wherein said pusher member slides along said shaft when driving said expander pin into said expandable body.

56. Apparatus according to claim 29 wherein said apparatus further comprises a cannulated driver assembly adapted to drive said expander pin into said expandable body.

57. Apparatus according to claim 56 wherein said cannulated driver assembly slides along a shaft connected to said expandable body.

58. Apparatus according to claim 56 wherein said cannulated driver assembly includes a trigger for inducing the driving of said expander pin.

59. Apparatus according to claim 56 wherein said cannulated driver assembly comprises a slap hammer.

60. Apparatus according to claim 5 wherein said at least one laterally-extending projection has a substantially convex configuration.

61. Apparatus according to claim 5 wherein said at least one laterally-extending projection has a substantially planar configuration.

62. Apparatus according to claim 5 wherein said at least one laterally-extending projection has a substantially concave configuration.

63. Apparatus according to claim 5 wherein said tissue attachment means further comprises at least one longitudinally-extending projection projecting distally out of said at least one laterally-extending projection.